Does urbanisation affect rural poverty? Evidence from Indian Districts[1]

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Abstract

Although the high rate of urbanization and the incidence of rural poverty are two distinctive features of developing countries, we still do not know what the effects of the former on the latter are. We address the issue by exploring the mechanisms through which urbanization may alleviate rural poverty, disentangling "first round" effects, due to migration of rural poor to cities, and "second round effects", due to positive externalities of city growth on surrounding rural areas. We test our theoretical predictions on a sample of Indian districts in the period 1981-1999, and find that urbanization has a substantial and systematic poverty reducing effect in surrounding rural areas. This effect is largely attributable to positive spillovers from urbanisation rather than to the movement of the rural poor to urban areas per se.

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1. Introduction

The transformation of an economy from agricultural and mainly rural to industrial and predominantly urban during the process of development has long been a well established fact (Lewis, 1954; Kuznets, 1955). But the direct implications of this transformation on the economic welfare of the population during this process appear to be less clear. In particular, what happens to surrounding rural areas when a city grows? Do they receive economic benefit from it and if so, to what extent? In a period of increasing urbanisation in most developing countries, answers to these questions would bear important implications for development policies.

Despite this, still very little is known on the actual economic impact of urbanisation on rural areas. This paper represents one of the first efforts to fill this gap, as it tries to measure the impact of urbanisation on rural poverty in the Indian context. It uses district-level panel data between 1981 and 1999 to show that urbanization has been an important determinant of poverty reduction. In our preferred estimations, we find that an increase of 100,000 urban residents in the representative district (around 21% increase from the mean) implies a decrease of between 3 and 6 percentage points in the share of rural poverty.

This analysis is all the more important as most of the world's poor reside in rural areas, where the incidence of poverty is higher than in urban areas across all developing regions. In 1993 rural areas accounted for 62% of the world population and for 81% of the world's poor at the $1/day poverty line; in 2002 after a period of intensive urbanisation the same figures stood at 58% and 76% respectively (Ravallion et al., 2007).[4] The process of urbanisation (which mostly concerns the developing world) has been accompanied by an unequal distribution of the global reduction in poverty rates. Between 1993 and 2002 while the number of $1/day poor in rural areas declined by 100 million, that of urban poor increased by 50 million. Ravallion et al. (2007) explain this "urbanisation of poverty" through two related arguments.[5] First, a large number of rural poor migrated to urban areas; thus they ceased to be rural poor and either they have been lifted out of poverty in the process (through a more productive use of their work) or they have become urban poor. This is a direct (or 'first-round' in Ravallion et al. (2007) terminology) effect of urbanisation on rural poverty. Second, the process of urbanisation impacts the welfare of those who remain in rural areas

[4] In fact the actual poverty line used by Ravallion et al. (2007) is $1.08/day; to save clutter we refer to it as the $1/day poverty line.
[5] The term "urbanization of poverty" was first introduced by Ravallion (2002).

also through second-round effects. The overall impact of urbanisation on rural poverty is substantial but in the absence of data on the poverty profile of rural-urban migrants it is not possible to distinguish between the two effects. We mainly focus on these second-round effects, trying to control for the direct effects of urbanisation on rural poverty.

Distinguishing between first and second-round effects is important. The former involves only a statistical association between urbanization and changes in rural poverty due to the very change in residency of some rural poor (who may or may not be lifted out of poverty in their move to the urban areas). This entails no causal link. On the other hand, second-round effects capture the impact of the urban population growth on the rural rate of poverty. Such a relation is causal in nature and tells us how good or bad urbanisation is for rural poverty. In a developing country context understanding this relation is particularly important as most population in these countries will still be rural for at least another decade and for another three decades in least developed countries (LDCs).[6] This figure along with the recognition that poverty has a higher incidence in rural than urban areas suggests that it is on this rural non-migrant population that the implications of urbanisation will be most important for global poverty reduction in the next future.[7] The focus on developing countries is also essential given that almost the entire future population growth in urban areas (94% in 2005-2030) is predicted to take place in developing countries (UN, 2008).

We consider Indian urbanisation at the district-level for the period 1981-1999. During this period the country urbanised at a relatively slow rate: urban population was 23.3% of the total in 1981 and 27.8% in 2001 (Government of India, 2001). However, given the sheer size of Indian population, this moderate increase turned into a massive rise in absolute number of urban dwellers (126 million). This represents an increase of almost 80% in urban population over the period. These figures mask a large variability in urbanisation patterns at the sub-national level: states have urbanised at very different rates. Among the major states, Tamil Nadu increased its share of urban population from 33% to 44% between 1981 and 2001, while Bihar maintained the same urbanisation rate over the period (13%). The differences are evident also in absolute terms: Uttar Pradesh increased its urban population by 28 million people (+140%); at the other extreme West Bengal added only 8 million to its urban population (+56%). Not only are the urbanisation dynamics different, but so is also the

[6] Based on calculations on UN (2008) data, developing countries are expected to become more urban than rural in 2018 and LDCs in 2045.

[7] This does not deny the importance of urban poor in global poverty. In fact these represent a substantial and increasing share of poor globally (although still lower than rural poor). However, estimating the effects of urbanisation on urban poverty would require another model altogether and it is left to the future research agenda.

geographical spread of urban areas. Figure 1 shows that the density of towns is concentrated in Northern India, roughly in the area along the river Ganges and in the South-East (Tamil Nadu in particular). Other areas, such as Andhra Pradesh, Madhya Pradesh and the North-West have significantly lower densities. Such variability (both in levels and in changes) is even more remarkable at the district level, as the left hand-side map in figure 2 shows. For instance a district like Idukki in Kerala increased its urban population by 13,000 (+29%) between 1981 and 2001, while urban population in Rangareddi (Andhra Pradesh) increased by 1.6 million (+416%) and in Pune (Maharashtra) by 2.4 million (+130%) over the same period. We try to exploit this variability in the subsequent analysis to identify the impact of urbanisation on rural poverty.

India in this period provides an interesting case also in terms of the policy environment and economic performance as the country experienced structural changes in economic policy, rate of growth, and poverty levels. After a long period of economic planning and import substitution industrialisation, the government started reforming the economy towards a more liberal regime in 1991. This change was brought about by the external payment crisis due to the government's deficit spending. Possibly helped by the liberalisation of the economy, economic growth took off since the mid-1980s, and more evidently since 1993, having increased more rapidly than in the 1960s and 1970s (Datt and Ravallion, 2002). Despite disagreements on the extent to which economic growth increased the welfare of India's poor, poverty in India declined steadily in the 1990s, particularly in rural areas (Kijima and Lanjouw, 2003). The geography of the decrease in the share of poor, however, is extremely variegated, as the right hand side map in figure 2 shows. While in many districts more than 30% of rural population was lifted out of poverty between 1983 and 1999, for around a quarter of them the share of poverty has remained roughly constant or has even worsened over the same period.

The paper's geographical focus is particularly important as India is the country with the largest number of both rural and urban poor. Its number of $1/day rural poor in 2002 was over 316 million, representing 36% of world's rural poor. Moreover its urbanisation process is still in its infancy as only 28% of the population was urban in 2000. The country is expected to add a further 280 million urban dwellers by 2030.[8] Thus estimating the impact of urbanisation on rural poverty in India may help identify the potential effects of this expected massive growth of urban population on the world's largest stock of rural poor.

[8] This is based on authors' calculations on UN (2008).

2. Urbanization and rural poverty: channels

Why would the increase in urban population have an impact on poverty in surrounding rural areas? There are various ways in which urbanisation and rural poverty are linked. We can distinguish between a simple composition effect due to migration of poor from rural to urban areas (first round effect), and a spillover effect due to positive externalities of urbanization on surrounding urban areas (second round effect). In the following, we analyse the main mechanisms through which the latter effect may take place. Then we'll discuss the way in which we can isolate second-round from first-round effects.

2.1. Second round effects

There are at least six main indirect channels through which urban population growth may affect rural poverty in surrounding areas: backward linkages, rural non-farm employment, remittances, agricultural productivity, rural land prices and consumer prices.

Backward linkages: An expanding urban area (both in terms of population and income) will generate an increase in the demand for rural goods. For perishable products and in general for those products whose markets are not spatially integrated (e.g. due to high transportation costs), such a demand will typically be met by surrounding rural areas; while the other agricultural products could be equally provided by locations further away (but ideally not too farther). This is linked to an idea that goes back to von Thünen's (1966) theory of concentric circles of agricultural specialisation around cities. This specialisation is determined by the size of transport costs. Rural locations close to urban areas specialise in high transportation cost goods, while locations further away specialize in lower transport cost commodities. The further one moves away from cities the more likely it is for rural communities to turn to self-subsistence in both agricultural and non-agricultural commodities. This is by and large the pattern found by Fafchamps and Shilpi (2003) for Nepal.

This channel is likely to operate via an *income* as well as a *substitution* effect. The former is related to the increased demand for agricultural goods due to higher incomes in urban areas relative to rural areas. Such a higher income is usually explained by urbanisation economies: urban areas have denser markets for products and factors, which raise labour

productivity and wages over the level of rural areas (see Fujita et al., 1999). The substitution effect relates to the increased share of higher value added products in total agricultural demand typical of more sophisticated urban consumers. Empirical evidence confirms this composition effect. Parthasarathy Rao et al., 2004 find that Indian districts with over 1.5 million urban population have a significantly higher share of high value commodities than the other districts. Thanh et al. (2008) show that per capita consumption of high value fruit in Vietnam has increased faster in urban than in rural areas over the nineties.

Rural non-farm employment: Expanding urban areas may also favour the diversification of economic activity away from farming, which typically has a positive effect on incomes (see e.g. Berdegue et al., 2001; Lanjouw and Shariff, 2002). This effect is particularly important in rural areas surrounding the cities. Three concomitant effects may explain such increased diversification. First, proximity to cities may allow part of the peri-urban workforce to commute to the city to work. This in turn generates suburban non-farm jobs in services, such as consumer services and retail trade, which are needed by the growing commuting population. Second, as cities provide dense markets where to trade goods and services more efficiently, rural households close to cities may afford to specialise in certain economic activities (based on their comparative advantage), relying on the market for their other consumption and input needs (Fafchamps and Shilpi, 2005). This more extensive specialisation should boost productivity and income (Becker and Murphy, 1992). Third, proximity to urban areas stimulates non-farm activities instrumental to agricultural trade (which is increased by urbanization), such as transport and marketing. Recent evidence from Asia provides strong support for the effect of cities in stimulating high return non-farm employment in nearby rural areas (see Fafchamps and Shilpi, 2003 on Nepal, Deichmann et al., 2008 on Bangladesh and Thanh et al., 2008 on Vietnam). On the other hand, and consistent with this line of argument, isolated rural communities do not tend to specialise and rely on subsistence activities dominated by farming. The growth of urban areas would raise the share of rural areas which are close enough to cities to develop a substantial non-farm employment base.

Remittances: Remittances sent back to rural households of origin by rural-urban migrants constitutes another potentially important second-round effect of urbanization on rural poverty. The vast majority of rural-urban migrants (between 80% and 90%) send remittances home although with varying proportion of income and frequency (Ellis, 1998). To

the extent that urbanization is (partly) fuelled by rural-urban migration, this growth may be associated with larger remittance flows to the rural place of origin. The positive effects of remittances in reducing resource constraints for rural households as well as providing insurance against adverse shocks (as their income is uncorrelated with risk factors in agriculture) have been clearly shown by the literature (Stark, 1980, Stark and Lucas, 1988). On the other hand the migrant's family often provides economic supports (monetary or in kind) to the migrant during his initial stay in the urban area. This support aimed at covering the fixed costs of migration can be interpreted as an investment whose main return is the counter urban-to-rural remittances flow which is received afterwards (Stark, 1980). This urban-to-rural remittance flow may somewhat reduce the net resources transferred to rural areas by urban workers.

Agricultural productivity: Urbanization and rural poverty can also be linked by the changes in rural labour supply that accompany the urbanisation process. To the extent that rural-urban migration reduces the rural labour supply, this may increase (reduce the decrease of) agricultural labour productivity, given the fixed land supply and diminishing marginal returns to land.[9] This may pose some upward pressure on rural wages. There is indeed some evidence in India of out-migration from rural areas being associated to higher wages in sending areas (Jha, 2008).

Rural land prices: The growth of cities may increase agricultural land prices (owned by farmers) in nearby rural areas due to the higher demand for agricultural land for residential purposes. This may generate increased income for landowners through sale or lease, or through enhanced access to credit markets, where land acts as collateral. Some evidence from the US indicates that expected (urban) development rents are a relatively large component of agricultural land values in US counties which are near or contain urban areas (Plantinga et al., 2002). The impact on rural poverty through this channel would crucially depend on the way this increased income is distributed across the rural population. Typically, if land is very concentrated, this channel is likely to benefit a few landowners, potentially restricting access to waged agricultural employment for the landless population. To illustrate, let us assume the extreme case of all rural land concentrated in the hands of one landowner, who employs

[9] In fact Eswaran et al. (2008) show that land to labour ratios decreased in most states in India over 1983-1999 as rural population growth rate more than offset rural-urban migration. In this case our argument would become: to the extent that rural-urban migration reduces the growth of the rural labour supply, this may reduce the decrease of agricultural labour productivity.

labour to cultivate it. If the growth of the nearby city pushes the price of the land above the expected value of the discounted stream of profits from cultivating the land, the landowner will sell it. This would leave all the agricultural labourers in the district unemployed. The net effect on poverty will depend on the extent to which the new use of the land will be able to absorb labour (e.g. via construction-related employment). However, given the constraints to the reallocation of agricultural labour across sectors and the high labour intensity of agriculture, we would expect the net effect on rural poverty to be adverse (i.e. increase in rural poverty) when land is highly concentrated (and vice-versa).

Consumer prices: to the extent that the growth of a city is associated with lower consumer prices, this may benefit surrounding rural consumers, who have access to urban markets. This effect may be due to increased competition among a larger number of producers in the growing urban area as well as to thicker market effects in both factors' and goods' markets (e.g. Fujita et al., 1999).

A further potential channel may relate to early arguments made by Jacobs (1969) and Dore (1987) that agriculture in rural areas surrounding cities also benefits from spillover effects in technology and marketing. However, to the best of our knowledge no specific evidence has been provided in support to this view yet.

Table 1: Ex-ante second-round effects of urbanization on rural poverty

	Predicted net effect	Reach of the effect
Backward linkages	+	Nearby rural
Share of non-farm employment	+	Peri-urban
Remittances	+	Rural
Changes in agricultural productivity	+	Rural
Rural land prices	+/- (depending on land concentration)	Nearby rural
Consumer prices	+	Nearby rural

Note: Reach of the effect is defined in decreasing order of distance from the urban area as: Rural; Nearby rural and Peri-urban.

Source: Authors' elaboration

Table 1 summarises the expected net effects of these second-round channels on rural poverty as well as their likely reach on rural areas. The total net effect of urbanization on rural

poverty is predicted to be clearly positive with the bulk of the effects being felt at a relatively small distance to the urban area (in surrounding rural areas). The next section will detail the methodology used to test these conjectures by measuring this total net effect in the case of Indian districts.

2.2. Disentangling first and second round effects

As discussed above, we are particularly interested in estimating the second round effects of urbanization on rural poverty. In order to do this we first need to disentangle the two effects and then to identify an appropriate way to control for the first round effects in the empirical analysis. This section deals with the former task. Let us assume N distinct geographical units (districts), each with population P_{it} at time t, split between urban (P_{it}^U) and rural areas (P_{it}^R), with $i \in [1, N]$. We can characterise the incidence of poverty (H_{it}^R) in rural areas in district i at time t as a function of the urban population of the district and a series of other characteristics of the district (such as its total population, specific policies, etc.), represented by the vector X:

$$H_{it}^R = f(P_{it}^U, X_{it}) + \varepsilon_{it} \qquad (1)$$

Let us assume that natural growth rate is zero and the only changes in the rural-urban split of the population are determined by one (or both) of these two phenomena: intra-district rural-urban migration or rural areas becoming urban (either because they are encompassed by an expanding urban area or because a village evolves into a town).[10]

Define α_t, σ_t and λ_t as respectively the share of poor in the rural population, the share of rural-urban migrants in rural poor and the share of rural poor that live in villages that become urban at time t. Define also γ_t as the share of rural-urban migrants in total rural

[10] This does not consider the possibility of inter-district migration, nor of urban-rural migration. The latter is relatively unimportant in influencing the rural-urban split of the population in a country like India. The stock of urban-rural migrants represented less than 1.4% of total population in the majority of Indian districts in 1991, with mean equal to 1.7% (based on the Indian districts database at the University of Maryland – see below). Inter-district migration represents instead a substantial share of total migration, in particular rural-urban. In 1991 it accounted for less than 34% of total migration for the majority of Indian districts (with mean equal to 37%); the share of inter-district migration in total rural-urban migration was even larger in 1997 (median 46%, average 49%). However, the empirical analysis below rejects the relevance of this type of migration in determining rural poverty. We could reconcile this finding with the model presented here by assuming that the distribution of inter-district migrants in both the sending and the recipient districts follows the rural-urban distribution of the those district's populations.

population at time t and φ_t as the share of rural population who live in villages that become urban areas at time t (with $\gamma_t \geq \alpha_{t-1}\sigma_t$ and $\varphi \geq \alpha\lambda$). We can then re-write (1) as:

$$H_{it}^R = \frac{\alpha_{t-1}P_{it-1}^R(1-\sigma_t-\lambda_t+\sigma_t\lambda_t)}{P_{it-1}^R(1-\gamma_t-\varphi_t+\gamma_t\varphi_t)} + g(P_{it}^U, X_{it}) + \varepsilon_{it} \qquad (2)$$

The first term on the right hand side of (2) defines the first-round effects of the growth of urban population on rural poverty. Ignoring the terms $\sigma_t\lambda_t$ and $\gamma_t\varphi_t$ as they are likely to be very small and the subscripts to save clutter, it is easy to show that the condition under which this first-round effect decreases the rural poverty incidence (ceteris paribus) is:

$$\sigma + \lambda > \gamma + \varphi \qquad (3)$$

The key variables here are the poverty distributions of both rural-urban migrants and dwellers of rural-urban transitional areas relative to the poverty distribution of the rural population. Assuming $\lambda=\varphi$ (i.e. the poverty incidence in rural villages that become urban is equal to that in total rural population of the district), condition (3) can be expressed in terms of the relative poverty distribution of rural-urban migrants:[11]

$$\sigma > \gamma \qquad (3')$$

Expression (3') is stating that if the distribution of migrants is skewed towards low income individuals – i.e, the incidence of poverty is higher among migrants than non migrants - then rural-urban migration will directly reduce rural poverty. This hypothesis seems to be supported by recent cross-country evidence by Ravallion et al (2007), who find a sizeable negative effect of urbanisation on the incidence of rural poverty. On the other hand the number of urban poor increased with urbanisation. Although they cannot isolate the direct effects of rural-urban migration, their finding would be hard to be reconciled without condition (3') to be verified.

[11] There is no empirical evidence establishing the size of λ relative to φ; but the assumption that rural villages which become urban areas have the same distribution of poverty as the other rural areas may be plausible. An exception could be those rural areas on the outskirts of large urban areas which may benefit economically from this vicinity (see Fafchamps and Shilpi, 2003 for Nepal). In that case $\lambda < \varphi$.

As the main aim of the paper is to estimate the size and direction of the second-round effects of urbanization on rural poverty, we can re-express (2) to control for the direct effects of urbanisation as well as for other covariates of rural poverty:

$$H_{it}^{R}(P_{it}^{U} \left| \sigma_{it}, \gamma_{it}, X_{it} \right.) = h(\sigma_{it}, \gamma_{it}) + g(P_{it}^{U}, X_{it}) + \varepsilon_{it} \qquad (4)$$

This expression represents the basis of the empirical analysis described in the next section. Effectively we need to estimate the partial derivative of H_{it}^{R} with respect to P_{it}^{U}. The channels described above should underlie the second-round effects that we are trying to capture through this partial derivative.

3. Empirical methods

Using a district-level analysis, we try to systematically assess whether and to what extent urbanization in Indian districts during the 1981-1997 period has affected rural poverty in those districts. In order to evaluate the eventual effects of urbanization on the people in extreme poverty, we also use specifications of rural poverty which try to isolate changes in the intensity of poverty for the very poor.

We argue that the district is an appropriate spatial scale for such an analysis in India as all of the first and second-round channels described above are likely to display most of their effects within the district's boundaries. This is consistent with the theoretical discussion above, arguing that the effects of city growth are concentrated in surrounding rural areas. Various pieces of specific evidence on India confirm that this is likely to be the case.

First, evidence suggests that intra-district migration in India is a large component of total rural-urban migration. According to the Census (Government of India, 1991), 62% of the total stock of permanent internal migrants was intra-district in 1991, although a share of this stock was composed of women migrating for marriage reasons.[12] However, a consistent part of internal migration in India is not captured by the Census as it does not involve change in residence. This may include various forms of temporary migration, such as seasonal and circular as well as commuting. Such a migration may account for an important part of income generation and livelihoods in several rural areas (Deshingkar and Start, 2003, and Deshingkar,

[12] This is in line with Topalova (2005), who finds limited labour mobility across Indian regions between 1983 and 2000.

2005). Due to its temporary nature, this migration is likely to be short-distance. In a recent survey of a number of rural villages in two Indian states, Deshingkar and Start (2003) reported that in a number of villages several households were commuting on a daily basis to nearby urban locations (although this movement was not registered in the migration data) and in one village, one entire caste took up casual labouring in the urban sector. This does not deny the existence of long-distance migration in India, which in fact has been on the increase during the nineties (Jha, 2008). However, long distance rural-urban migration is mainly directed to a few growing metropolitan areas, such as Mumbai, Delhi, Bangalore and Chennai, which are excluded from the analysis.[13] Notwithstanding the importance of intra-district migration, in the empirical section we also test the robustness of the results against the relative size of the intra-district migrant population.

Second, during the period of analysis (1981-1999) most perishable agricultural goods' markets do not appear to be well integrated at the national or even at the state level in India. This is due to relatively poor transport infrastructure networks and lack of appropriate technology (such as cold storage facilities).[14] Agricultural produce is often sold in nearby towns and even most trade in livestock tends to occur at short distance. This is due to lack of infrastructure, which brings livestock's marketing costs to distant markets to 20-30 percent of the sale price (Chandra Mohan Reddy, 2000). As a result, most transactions in live animals take place within the same district (Birthal, 2005). Thus we would expect a consistent share of agricultural trade to occur at a small distance, making district a suitable spatial scale to capture a substantial part of the first two channels above as well. In line with these ideas, some studies have performed district level analyses to try to capture demand-side effects on agriculture. Parthasarathy Rao et al. (2004) for instance analyse the effects of urbanisation on agricultural diversification into high value commodities, such as fruit, vegetables, dairy products, using district as the unit of analysis.

There is also emerging evidence of increases in land prices in peri-urban and rural areas surrounding urban agglomerates. Land values in those areas may be well above the discounted future stream of income from agricultural activity, having induced several landowners to sell the land (Jha, 2008).[15]

[13] We exclude them either because the district which contains them does not have any rural area (e.g. Delhi, Urban Bangalore) or because the effects of their growth are likely to extend well beyond the boundaries of their district.

[14] Infrastructure endowments have to certain extent been upgraded since then.

[15] All of this evidence seems to be roughly consistent with Fafchamps and Shilpi (2003), who find that in Nepal the effects of proximity on rural areas peters out beyond a four hour radius (in travel time) around cities. Using the boundaries of Indian districts as in 1987, the average district size in our analysis is around 7,300 Km^2. If we

The core idea of the empirical analysis is then to assess the effects of urbanization on rural poverty at the district level over time. For that we estimate equation (4) controlling for the direct effects of urbanisation as well as for other determinants of rural poverty. We use the basic specification:

$$H_{dt}^{R} = \beta_0 + \gamma_d + \beta_1 P_{dt-j}^{U} + \chi X_{dt} + \varepsilon_{dt} \qquad (5)$$

where H_{dt}^{R} is a measure of rural poverty in district *d* at time *t*, γ is district fixed effects, P_{dt-j}^{U} is the urban population of district *d* at time *t-j* (where $j \in [0,2]$), and *X* is a vector of variables, which include both the controls for the effects of urbanization on rural poverty and other variables likely to have independent impact on rural poverty. The district's urban population is computed as $P_{dt}^{U} = \sum_{i=1}^{N_d} u_{it-j}^{d}$, where u_{it-j}^{d} is the population of town *i* in district *d* at time *t-j* (where $j \in [0,2]$) and N_d is the number of cities in district *d.*

4. Data and variables

Data to run specification (5) comes from three main sources: districts level measures of poverty are available from various rounds of the Indian household survey data (National Sample Surveys), which have been appropriately adjusted by Topalova (2005) for the 1983-84, 1987-88, 1993-94 and 1999-2000 rounds of the NSS.[16] Other district level data, such as on population composition come from the Indian districts database at the University of Maryland (which has been extrapolated from the original data in the Indian Census).[17] Data on towns' population are available from various rounds of the Indian Census. In addition, for crops production volumes and values we use the district level database for India available with International Crops Research Institute for semi-Arid Tropics (ICRISAT) from 1980 to 1994 and recently updated by Parthasarathy Rao et al (2004) up to 1998.[18]

The district classification has been modified during the period of analysis, as some districts have been split into two units. Topalova (2005) created a consistent classification by aggregating the 2001 districts originated from the splitting into the district division of 1987.

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approximate the district with a circle, a city located in the centre of it would be at around 50 Km from the boundary of the district. It is plausible that in several districts this distance could be covered in about three to four hours on rural Indian roads during the period considered.

[16] Although each survey was carried out over two years, we refer to them with the first of the two years.

[17] Available at www.bsos.umd.edu/socy/vanneman/districts/codebook/index.html

[18] The original source of this data is the Government of India, Directorate of Economic and Statistics, Ministry of Agriculture and Cooperation.

We conform to this re-aggregation and modify the original population and demographic data accordingly.

***Dependent variables**:* We use two standard Foster Greer Thorbecke (FGT) measures of poverty as dependent variables: the poverty headcount ratio and the poverty gap index. FGT poverty measure for a given rural population is defined as:

$$H_{\alpha}^{R} = \int_{0}^{z_R} \left(\frac{z_R - y}{z_R} \right)^{\alpha} f(y)dy$$

where z_R is the rural poverty line, and *f(y)* is the distribution function of monthly per capita expenditure (in this case), with the rural population ordered in ascending order of *y* (i.e. starting from the poorest). The headcount ratio is computed by setting α=0, thus it represents the proportion of the population below the poverty line (poverty rate). However as this measure does not capture the extent to which households fall short of the poverty line, we also use the poverty gap index. This is computed by setting α=1 and is defined as the normalised aggregate shortfall of poor people's consumption from the poverty line. Both measures are increasing in poverty, i.e. a higher value means a higher level of poverty.[19]

Population variables: the Census 1991 (and 2001) classifies as towns all the statutory places with a municipality, corporation, cantonment board or notified town area committee, or, alternatively, places satisfying simultaneously the following three criteria: i) a minimum population of 5,000; ii) at least 75 per cent of male working population engaged in non-agricultural pursuits; and iii) a density of population of at least 400 per sq. Km. This is consistent with the classification of the 1981 Census, except for condition iii), which required a minimum population density of 1000 per sq. Km. The use year effects should control for eventual problems of consistency of urban data over time. Importantly, the NSS uses the Census definition to classify urban vs. rural areas, thus ensuring the consistency of data across sources.

There are 5179 towns meeting these criteria in 2001. We calculated the total urban population at the district level, by summing the figures for towns. Due to its peculiar nature,

[19] In the subsequent analysis we also run some specifications using poverty rate as a control and poverty gap as the dependent variable. This tries to capture a concept more closely related to extreme poverty, as it nets out the share of poor (poverty rate) from the share of the poor weighted by each poor's distance from the poverty line (poverty gap).

we excluded from the dataset the State of Delhi and the districts of the other megalopolises, Calcutta, Chennai, Bangalore and Mumbai; we also excluded other three districts due to an extraordinary increase in urban population in the period under study, which is extremely likely to be imputable to errors in the data: Anantapur in Andhra Pradesh, Kanniyakumari in Tamil Nadu, and Thane in Maharashtra.

As population data are available only with ten-year frequency (1971, 1981, etc.), we estimated the values for the year 1997 by non linear interpolation, in order to conduct the analysis for three rounds of the NSS. We first estimated the yearly growth rate in the period 1991-1997, calculating a weighted average of the growth rate of the 1981-1991 and 1991-2001 periods; we then calculated the 1997 population applying the estimated growth rate to the 1991 level.[20]

There are 431 districts in the original Topalova's (2005) dataset, 409 of which have positive urban population (at least for one of the three time periods); total population figures are available for only 363 of these, which therefore constitute our main sample of analysis; in the year 2001, this sample accounts for a total of 1,000,053,152 population and 270,153,691 urban residents, corresponding to 97% and 94% of the Indian total respectively.

Controls: Following the discussion in section 2, we could control for the direct effects of urbanization on rural poverty, i.e. the term $h(\sigma_{it}, \gamma_{it})$ in (4), by including a variable measuring the extent to which migrants are over-(under-)represented among the poor (σ_t) relative to the whole rural population (γ_t).[21] Equation (5) would then become:

$$H_{dt}^{R} = \beta_0 + \gamma_d + \beta_1 P_{dt-j}^{U} + \beta_2 (\sigma_{dt} / \gamma_{dt}) + \chi X_{dt} + \varepsilon_{dt} \qquad (5')$$

with $\beta_2>0$ (due to condition (3')). However, we do not have data to compute σ_t. Thus we use two types of variables in order to proxy for $\sigma_{dt} / \gamma_{dt}$ in (5').

The first is the district's urban poverty rate H_{dt}^{U}. To see why, let us re-express H_{dt}^{U} on the basis of the variables in question. Consider that H_{dt}^{U} depends on the urban poverty at *t-1*, on the share of rural-urban migrants whose income in the urban sector is below the urban

[20] The exact specification adopted is the following: *pop(1997) = pop(1991)*[1+yg(1981-1991)*0.3+ +yg(1991-2001)*0.7]*^{6} , where yg(t-T) is the yearly growth rate of the period t-T.

[21] Note that for simplicity we keep the condition above $\lambda_t=\varphi_t$ (for any *t*), i.e. the share of rural poor that live in villages that become urban at time *t* is equal to the share of rural population who live in villages that become urban areas at time *t.*

poverty line and the change in the poverty rate of previous urban dwellers.[22] Dropping the subscript *d* to save clutter, we have:

$$H_t^U(\pi_t, P_{t-1}^R, \gamma_t, \sigma_t) = \frac{\psi_{t-1}P_{t-1}^U + \rho_1(\pi_t)(\gamma_t - \alpha_{t-1}\sigma_t)P_{t-1}^R + \rho_2(\pi_t)\alpha_{t-1}\sigma_t P_{t-1}^R + \Delta\psi_t(\pi_t)P_{t-1}^U}{P_{t-1}^U + \gamma P_{t-1}^R} \quad (6)$$

where ψ_{t-1} is the urban poverty rate at time *t-1*, ρ_1 and ρ_2 are respectively the share of non-poor rural migrant ($\gamma_t - \alpha_{t-1}\sigma_t$) at time *t* as a function of π_t and the share of poor rural migrants $\alpha_{t-1}\sigma_t$ at time *t* who have become urban poor at time *t*; $\Delta\psi_t$ is the change in poverty rate (between *t-1* and *t*) of the existing stock of urban population at *t-1*, and π_t is the urbanization rate at time *t*. From this expression it follows that $\rho_1 \leq \rho_2$ and $\partial\rho_1/\partial\pi_t < 0$, $\partial\rho_2/\partial\pi_t < 0$. For any values of π_t we can compute the condition for which $H_t^U < H_{t-1}^U$ (i.e. a reduction in the urban poverty rate between *t-1* and *t*) as:

$$z(\sigma, \gamma | \pi_t) = \alpha\sigma(\rho_1 - \rho_2) + \gamma(\psi - \rho_1) > \Delta\psi P_{t-1}^U (P_{t-1}^R)^{-1} \quad (7)$$

with $\partial z/\partial\sigma \leq 0$ (as $\rho_1 \leq \rho_2$) and $\partial z/\partial\gamma \leq 0$ if $\psi \leq \rho_1$.

Equation (7) implies that for any given value of urban economic growth at time *t*, urban poverty is more likely to have decreased between *t* and *t-1* the lower the share of rural poor that migrated to the urban areas during this period (σ_t). This is explained by the fact that the probability that poor rural-urban migrants become urban poor (after migrating) is higher than the same probability for non-poor rural-urban migrants. On the other hand a smaller rural-urban migrant population will decrease urban poverty only if the incidence of poverty in this population once it becomes urban is larger than the pre-existing incidence of poverty in the urban area ($\psi \leq \rho_1$). Condition (7) therefore implies that the evolution of urban poverty over time should capture the evolution of the parameters γ and σ at time *t* for any given value of π_t. This means that at any given time urban poverty should capture the combined effect of economic growth and of the direct effects of urbanisation on rural poverty (the term $h(\sigma_{it}, \gamma_{it})$ in (4)).[23]

[22] For the sake of simplicity we do not consider here rural-to-urban transformation of villages. Adding it would not change the basic argument.

[23] Following the criticism of Hasan et al. (2006) on the potential bias in Indian urban poverty data at the district level, we use urban poverty at the regional level, which is a Census-based aggregation of a few districts together.

We also control for the first-round effects of urbanization on rural poverty through the socio-demographic composition of the rural population (i.e. age and literacy). Again, this is an indirect form of control and is probably less effective than the share of urban poor in capturing first-round effects. The rationale behind it relies on the assumption that the income distribution of migrants can be expressed as a function of the migrants' age composition. Other things being equal, poverty incidence tends to be lower among young adults (i.e. 15-34), as they represent the most productive age class. Therefore the higher the share of young adults in total migrant population (relative to their share in the rural population) the lower the probability that urbanisation will directly reduce rural poverty. Rewriting expression (3') we have: $\frac{\sigma}{\lambda}(\lambda_{15-34}) > 1$, with $\partial \frac{\sigma}{\lambda} \Big/ \partial \lambda_{15-34} < 0$, where $\lambda_{15\text{-}34}$ is the share of people aged 15-34 in total migrants relative to their share in the rural population. The same argument can be applied to literate migrants. As we do not observe the composition of the migrants' population, we can only control for it indirectly through the composition of the actual rural population. This is based on the plausible assumption that the change in the number of young adults in rural population is inversely related to the change in their number in rural-urban migrant population in the same period.

This assumption is supported by the results of regressing the 1981-91 change in the urban population in the 15-34 age group ΔP^{U}_{15-34} on the change in the rural population in the same age group ΔP^{R}_{15-34} (controlling for changes in district's total population and total population in 1981):

$$\Delta P^{U}_{15-34} = \underset{}{-4954} \quad \underset{(29.44)}{-1.038\Delta P^{R}_{15-34}} \quad \underset{(38.71)}{+0.2554\Delta P^{tot}} \quad \underset{(11.93)}{+0.0123P^{tot}_{t-10}}$$

N=334 $R^2 = 0.97$ (robust t-statistics in parenthesis)

The coefficient of ΔP^{R}_{15-34} is not statistically different from -1 indicating that changes in rural population are reflected in mirror changes in urban population (through either rural-urban migration or rural-to-urban change in status of villages).

Obviously, the incidence of young adults (as well as literates) in rural population also directly and positively affects rural income and thus has a direct impact on the poverty rate. Therefore this variable will capture two contrasting effects on rural poverty: a first-order

poverty reducing effect and a second-order poverty increasing effect (which should capture part of the direct effect of urbanisation on rural poverty).

The two variables which should control for the composition of the rural population are the number of people in the age group 15-34, and the proportion of literates in this age group. The latter variable is meant to capture the level of literacy of the most productive part of the population, following the idea that the most powerful influence of education on income and poverty is through its labour market effect. We also include in some specifications the share of rural population which is reported as scheduled castes and scheduled tribes, as this is expected to have an independent (adverse) effect on poverty.

However it is likely that other unobserved factors affect the relationship under scrutiny. We exploit the panel dimension of our dataset to deal with that. First, we include a district fixed effect, which absorbs any time-invariant component at the district level, such as geographical position, climatic factors, natural resources, etc. Second, we add a whole set of state-year dummies, which control for state-specific time-variant shocks (including economic dynamics and policies). The inclusion of these controls may still not completely account for three other sources of potential bias in the coefficient of interest β_1 (capturing the second-order effects of urbanization on rural poverty in (5)).

First, there may be unobserved time varying district-specific shocks which may affect both rural poverty and urban population. For example there may be a localised shock (e.g. the election of an effective district government), which spurs district's economic growth. As economic growth is generally associated with urbanisation, this may foster urbanization while reducing rural poverty at the same time. This omitted variable problem would imply a spurious negative association between the two variables. Data on income per capita at the district level is not available to us. As economic growth directly affects urban poverty (as described above) the inclusion of the urban poverty rate in the controls should minimise this problem.

Second, unobserved time varying rural specific shocks may affect urbanisation via increases in agricultural productivity. This view is supported by a long-standing argument in development economics that a country's urbanisation (and industrialisation) process is fuelled by increasing agricultural productivity (e.g. Nurske, 1953). In closed economies an expanding urban population needs increases in productivity of the rural sector in order to be sustained. However, Matsuyama (1992) shows that in open economies this need not be the case, as they can rely on agricultural import for their subsistence (as in the case of the East Asian newly industrialised economies). In our case, districts can probably be considered as small open

economies, which can trade across borders in most agricultural markets, thus this potential source of bias may not be very relevant in this analysis.[24] In line with this Fafchamps and Shilpi (2003) do not find that agricultural productivity of nearby rural areas is an important determinant of city size in Nepal. To be on the safe side, we also control for a measure of agricultural productivity. The variable is constructed as the sum of the total quantities of 22 different crops produced in a given district, multiplied by the average India-wise price of the respective crop in the same year and divided by the district's rural population. This is in some way an extra control as it may eat up some of the effects of urbanization on rural poverty, which may occur via its effects on agricultural productivity (see channel two above).[25]

Instrumental variable: Finally, there may be a problem of reverse causation to the extent that rural poverty drives rural-migration. It could either act as a push factor (i.e. poorer people migrate in search of an escape out of poverty) or in the presence of high fixed costs of migration, it may act as a restraint to migration. If the former case prevails (i.e. poverty is mainly a push factor), the coefficient β_1 in (5) would be downwardly biased; while the opposite is true if the latter effect of poverty on migration dominates. The findings by Ravallion et al (2007) that rural-urban migration globally has been associated to large reduction in the number of rural poor lends some credit to the importance of the former case. Kochar (2004) provides also indirect support to this hypothesis showing that in India landless households have the highest incidence of rural-urban migrants among rural households.[26]

Regardless of the direction of the bias, we need an additional variable which may act as a valid instrument, i.e. it must be correlated with district urban population, but has to be exogenous to poverty-induced rural-urban migration flows. A variable which satisfies both requisites is the number of people who migrate to urban areas of the district from states other than the one where the district is located. It is plausible to assume that rural poverty in a given district has no effect on migration decisions in other states, which typically do not share the same rural condition of the district in question. On the other hand, the number of migrants coming to district towns from other states is part of the urban population of the district, thus bearing a positive association with our main explanatory variable. Although measurement

[24] This argument is not necessarily at odds with the district-level backward linkages channel described above. Urban areas tend to import agricultural products relatively more by surrounding rural areas, but this does not rule out that they can rely on inter-district agricultural trade as well.

[25] Data on agricultural production is not available for all the districts. The inclusion of this variable implies a reduction of the sample to 275 districts.

[26] His finding emerges in the context of the response of rural schooling decisions to the possibility of employment in urban areas, which tends to be larges amongst landless households.

error is not likely to be a major cause of concern in our analysis, it is worth noticing that the IV estimation may also correct eventual biases arising from errors in the measurement of urban population. This is the case if the measurement error of the instrument and that of the instrumented variable are independent.

5. Results

Table 2 presents the results from regression (5) using OLS estimation. Our dataset includes observations on 363 districts for three different time periods: 1983, 1993, and 1999. We run (5) applying a two years lag to the measure of urban population and to the other demographic controls for two main reasons. First, in this way we reduce the risk of potential simultaneity bias**.** Second, the two-year lag allows us to minimise the use of interpolation for obtaining the Census variables (both population and socio-demographic variables), which are recorded in 1981, 1991 and 2001.[27] We also include district and state-year fixed effects in all specifications. Standard errors are robust to heteroscedasticity (using the Huber-White correction) and allow for intra-group correlation within individual observations.[28]

1983-1999 period

We run a number of different specifications in Table 2, testing the robustness of the results to the inclusion of a number of controls and the use of different dependent variables. When controlling only for rural population (as well as for the range of fixed effects described above), the result indicates that the growth of urban population exerts a highly significant poverty reducing effect on rural areas (column 1). This result is robust to the inclusion of socio-demographic controls for the rural population, including the share of scheduled caste, the share of young adults (15-34 age group) in the rural population and the share of literates in the young-adults rural population (column 2).[29] These last two variables are meant to capture a change in the composition of the rural population and therefore should partly absorb the first round effects of urbanization on rural poverty. The inclusion of these controls slightly decreases the urban population coefficient. The signs of the controls are as expected, except

[27] In any instance the results are not sensitive to the change in the time lag, i.e. applying a 1 and 0 year lags (results available upon request).
[28] Note that the main results are robust to more basic computations of the standard errors as well.
[29] We tried to include the share of scheduled tribes in rural population as well, but that is never significant in the different specifications we tried. As this variable is systematically less significant than the scheduled caste variable, we only include the latter as a control.

for the share of literates: a higher share of young adults decreases poverty, while a higher presence of scheduled caste increases it (although not significantly). This suggests that the direct effect on poverty of the young adult population prevails over their indirect effect which captures the rural-urban migration of young adults. The share of literate has a poverty-increasing, albeit not significant, effect. At a closer inspection, this unexpected effect of literacy is driven by its Post-1993 impact. As shown in column 3, the coefficient of this variable turns negative (but not significant) when we account for the significant poverty increasing impact of literacy in the post-1993 period. In this period a higher incidence of literates in the most productive part of the rural labour force was associated with higher levels of rural poverty. Understanding the rationale of such an unexpected result is beyond the scope of our analysis, but we will suggest a possible reason for it below. Accounting for this differential impact determines also an increase in the urban population coefficient, as its effect is probably estimated with more precision. This coefficient is slightly above that of column 1, suggesting that rural socio-demographics may be capturing some first-round impact of urbanisation, which in this case increases rural poverty. As discussed above, this would be the case if a high level of urbanization were fuelled by high intra-district migration rates. As young adults are over-represented in the migrant population, and as this is the most productive (and thus least poor) part of the population, there may a positive association between urbanization and poverty via this type of first round effects. The rest of the direct effects of urbanization on rural poverty should be captured by the inclusion of urban poverty rate as a control. This is significantly and positively correlated with rural poverty (column 4). As urban poverty captures both the effects of district's economic growth (πt) on rural poverty and the direct effects of urbanisation on rural poverty, this suggests that the former are larger than the latter i.e. $\left|\partial H_t^U / \partial \pi_t\right| > \left|(\partial H_t^U / \partial \sigma) + (\partial H_t^U / \partial \gamma)\right|$ in (6). The inclusion of urban poverty reduces the urban population coefficient, confirming that the rural poor tend to be over-represented in the migrant population. However this reduction is very mild: the coefficient goes down from -0.0066 to -0.0061 (column 3 to column 4).[30] Following the discussion in the preceding section, we interpret this as a clear indication that most of the effect of urbanization on rural poverty is given by "second round" mechanisms.

Although robust, the magnitude of the effects of urban population on rural poverty over the 1981-1999 period is not particularly strong. An increase in the district's urban

[30] Note that this reduction is in no way attributable to the slight change in the sample's composition from 363 to 354 districts, as confirmed by running the same regression as in column 3 on the same observations as those of column 4 (results available upon request).

population of 200,000 (a 43% increase from the mean value) reduces on average the poverty rate by 1 to 1.4 percentage points according to the specifications. Given that the average share of rural poverty over the period considered is 32%, this effect ranges between 3.2% and 4.2% of the mean poverty rate.

Results using the poverty gap index as the dependent variable are less robust than those using the poverty rate (columns 5 and 6). Urban population exerts a negative but mildly significant effect on the poverty gap with the other controls keeping the same sign as in the preceding regressions. This result appears to be driven by the effects of urbanisation on those poor who are relatively close to the poverty line. When the rural poverty share is included among the explanatory variables, the urban population has a positive albeit not significant effect on the poverty gap (column 6), which would suggest that the poor closer to the poverty line are those who benefit most from urbanisation. This category does not include those poor far behind the poverty line. In the absence of more precise data, we could only speculate about why this may be the case. The effects of urbanisation are not likely to concern much the very poor. For example, the increase in demand for agricultural goods may affect those involved in commercial agriculture, who own capital and/or certain skills usually not available to the very poor. The same can be said about rural-urban migration: the very poor may not have enough capital to cover the fixed costs of migration. For these reasons urbanisation seems to have a fairly neutral effect on the very poor rural dwellers. Interestingly, the presence of rural dwellers from the scheduled caste is negatively associated with severe poverty. Along with the results from the preceding regressions, this suggests that the scheduled caste population tends to be concentrated among the rural poor close to the poverty line, but not among those in severe poverty.

We also test for the effects of urbanisation on the *number* of rural poor (column 7), obtaining similar results. For every increase in urban population by 100 people the rural population in poverty decreases by 13 people. The other controls are in numbers rather than in share (except for scheduled caste). Following the discussion in section 4, this represents a different way of controlling for the first round effect of urbanisation on rural poverty. In this way the urban population variable may be capturing some of the effects of changes in the remaining rural population (net of the young adult population). The controls maintain the same sign as in the previous regressions, except for rural population which is now positive and significant and literates in the 15-34 year group, which is now negative and significant. The former result is expected as, other things being equal, a larger rural population is associated with more rural poor. The latter captures the direct association between literacy

and poverty, which is negative. This may be different from the preceding regressions using shares as those may capture second-order effects of literacy on poverty.[31]

1983-1993 period

We then examine the impact of urbanisation on rural poverty using only the first two time periods available, covering the time interval 1981-1993. This is a robustness check for our results with three time periods, as in this case no interpolation of urban population is needed. It is also an interesting analysis per se as it focuses only on the pre-liberalisation period. Overall, the effect of urbanisation on rural poverty is stronger than over the entire period (Table 3). The coefficient for urban population ranges between -0.008 and -0.011 depending on the specification. This is almost twice as large as the range reported in Table 2. An increase in the district's urban population of 200,000 reduces on average the poverty rate by between 1.6 and 2.2% of total rural population. The basic specification without controls (except for the fixed effects) confirms the negative relationship between urbanisation and rural poverty, although it is only mildly significant (column 1). The inclusion of socio-demographic controls increases the significance and the size of the coefficient, again confirming that some adverse first-round impact of urbanisation on rural poverty is taken away by these controls (column 2). Both the share of young adult in the rural population and the share of literature in the young adults exert a poverty-reducing impact. This supports the hypothesis of a differential impact of literacy on rural poverty over time, i.e. poverty-reducing up to 1993 and then poverty-increasing. The results are robust to the addition of the share of urban poverty (column 4). However, this time the magnitude of the coefficient of urban population increases from 0.0099 (column 3, which uses the same sample as in column 4) to 0.0110. This increase suggests that the first-round effects of urbanisation on rural poverty captured by urban poverty may have been poverty-increasing in the eighties. Again this is a very small change, confirming that second-round effects are likely to dominate first-round ones. The impact of urbanisation on the poverty gap index is negative but less significant than for the entire period (column 5), while the impact on severe poverty seems to be neutral again. Finally, the results hold also when using the number of rural poor as dependent variable (column 6). Again, the elasticity of poverty reduction is much higher than when considering the 1981-1999 period.

[31] When we control for the number (instead of the share) of urban poor to better control for first-round effects of urbanisation on rural poverty, the elasticity of reduction in rural poor is slightly lower (results available upon request).

5.1. Further robustness

To control for eventual endogeneity due to the potential effects of agricultural productivity on urbanisation, we add a measure of agricultural productivity as well to the list of controls. This variable is lagged one year, given that the simultaneity bias should not be an issue in this case (but a contemporaneous specification is not possible due to the lack of data for 1999). The main results reported in Table 4 appear to be robust to the inclusion of such a measure. Surprisingly, the urban population coefficient for the entire period increases (column 1). However, this effect is mainly due to the restricted sample for which agricultural data is available. When we run the same regression as in Table 2 column 4 with the same sample as in Table 4 column 1, the increase in the size of the urban coefficient disappears (column 2). To the extent that part of the poverty-reducing effects of urbanisation may operate through increases in agricultural productivity (see section 2 above), the unchanged urbanisation coefficient is somewhat a puzzling result. The key to explain this may be the surprisingly weak (negative) effect of agricultural productivity on rural poverty (column 2). If this is the case, then the effects of urbanisation via productivity increases would be fairly insignificant as well. As a matter of fact, when restricting the analysis to the 1983-93 period, the coefficient of agricultural productivity becomes negative (as expected) and the magnitude of the urbanisation impact on rural poverty decreases slightly, although it maintains its significance (column 3 vs. column 4). This suggests that agricultural productivity may have had a different impact on rural poverty in the post-1993 period. Column 5 provides confirms such a hypothesis, as the post-1993 effect of productivity appears to have been robustly adverse to rural poverty. Such a surprising finding may not be in contradiction with earlier literature on India, which has shown the key effect of higher farm yield in poverty reduction only until 1994 (Datt and Ravallion, 1998).[32] Investigating the reasons behind this adverse post-1993 impact is beyond the scope of our analysis, and we only speculate about a possible explanation for it. This may lie in the (negative) effect of agricultural productivity on rural employment in the non-farm tradable sector (e.g. rural industry). Foster and Rosenzweig

[32] However, our result may appear to be at odds with recent work by Eswaran et al. (2008), finding that increases in agricultural productivity explain most of the rise in agricultural wages in the 1983-1999 period. The contradiction may be more apparent than real due to substantial methodological differences. First, Eswaran et al. use agricultural wages as an indicator of poverty; second, they perform the analysis on the whole economy without distinguishing between the rural and urban sector; finally, they do not use econometric techniques to estimate the impact of the agricultural productivity on agricultural wages.

(2004) find this pattern for Indian villages and explain it through the negative incentives that agricultural productivity growth provides to capital in the non-farm tradable sector through higher wages. To the extent that non-farm growth is especially pro-poor (as rural industry tends to productively employ the main asset of poor rural households, i.e. low-skilled labour), then this negative effect on non-farm growth may dampen that of agricultural productivity growth on rural poverty. This effect may have been particularly strong in the post-liberalisation period (i.e. post-1991), when capital was freer to move in search for lower-wage locations (see Aghion et al., 2007). Incidentally, the same argument may also help explain the adverse impact of literacy on rural poverty in the nineties. To the extent that literate labour has a higher reservation wage than illiterate labour, a high share of literate labour may have acted as a restraint to investments by the non-farm tradable sector.

We already mentioned that to the extent that rural-urban migration occurs across districts, the identification strategy may not enable us to properly capture the channels linking urbanisation to rural poverty. In order to control for that, we would need to construct a variable that measures the weight of rural-urban intra-district migration in total rural emigrant population. By interacting this variable with urban population, we could control for the fact that the effects of urbanisation on rural poverty would be better identified in those districts with a relatively higher share of internal rural-urban migration in total rural emigrants. However, the data available does not allow us to compute such a share; we instead compute a rough approximation of this measure by dividing intra-district rural-urban migration by rural population. Including the interaction between this variable and urban population leaves the results unaffected (column 6) with the interaction term bearing an expected but insignificant negative coefficient. We also use a different variable, i.e. the ratio of intra-district rural-urban migrants over the urban immigrants from other districts, obtaining similar (negative and non significant) results (not shown here). The lack of significance of these results may be due to the imprecise measure of the importance of intra-district migration.

Finally, we test for the importance of the backward linkages effects of urbanisation on poverty. As urban agricultural demand affects the district's rural sector more intensely in less spatially integrated markets, ideally we would need information on the share of urban demand of perishable products in total urban demand. As we do not have this information, we compute a rough approximation of it based on agricultural data: the share of land cultivated fruits and vegetables (proxy for perishable goods) in total land cultivated. This measure relies on a number of assumptions, i.e. that a district's supply is a good proxy for urban demand and that fruits and vegetables are the main perishable agricultural goods. The interaction term

between this share and the urban population variable has an expected negative coefficient (i.e. the higher the share the more poverty-reducing the urbanisation impact) – column 7. Again, this is not significant, possibly due to the imprecision of the measure. Also, the inclusion of this interaction term reduces the explanatory power and the significance of the urbanisation variable. This may be due to the high collinearity between the two variables generated by the little variation of the fruit and vegetable share over time.

Given that limiting the spatial extent of the effect of urbanization within the border of single districts may be questionable, we also run the same specifications of tables 2-4 adding a spatially lagged urbanization variable, i.e., the average of the urban population of the contiguous district.[33] We also tried to include the spatial lag of total population. These variables however were never significant, while other coefficients were only minimally affected. We do not report the results for brevity, but they are available from the authors upon request.

5.2. IV estimation

Although the results are neat, we still need to control for the direction of causality in the relationship between urbanisation and rural poverty. As rural poverty declines (increases), rural-urban migration rate and thus urbanization may slow down (rise) as well. This would provide a source of (downward) bias in the coefficient. Without properly controlling for this potential endogeneity, the coefficient of equation (5) may well be downwardly biased, which means the estimates in Table 1 may be lower in absolute value than the real ones.[34]

We resort to Instrumental Variable estimation (two stages least squares) to deal with this problem, using the number of migrants from other states to the urban areas of the district as instrument. The first stage regressions, reported in different specifications in table 5, substantiate the strong correlation of the instrument with the instrumented variable, and F-statistics are well above the confidence threshold of Stock and Yogo (2005) test for weak instruments (Table 5-6, last row).

In analogy with OLS, IV estimations' standard errors are robust and allow for intra-group (individual observation) correlation. Specifically, we calculate them by using the

[33] Technically, the variable is equal to Wx, where W is a row-standardized queen contiguity matrix, and x is the vector of urban population of districts.

[34] This is subject to the caveats that the sign of the bias in a multivariate regression depends also on the correlation with other regressors; and that the direction of the reverse causality may also be the opposite if poverty is a constraint to migration rather than a push factor.

xtivreg2 Stata command (Schaffer, 2007) which in turn calls the *ivreg2* command (Baum et al, 2008), partialling out year-state dummies in order to get the covariance matrix of orthogonality conditions of full rank. This leaves consistent estimates, as confirmed by a comparison with the IV regression without clustered standard errors.

Results from the second stage regressions confirm the suspect of a downward bias of the OLS parameters, with new estimates being roughly twice as large as the OLS estimation for the period 1981-1999 (Table 6). This in turn implies a fairly substantial impact of urbanisation on rural poverty, with the rural poor decreasing by between 2% and 3% of district's rural population as the effect of an increase by 200,000 in urban residents (columns 1-3). The IV analysis confirms the little effect of first-round relative to second-round effects of urbanisation on rural poverty (column 1 to 2). Again, the results are robust to the inclusion of agricultural productivity variables as control. We also run the IV estimation using poverty gap as dependent variable. The change in the magnitude of the urban coefficients compared to the OLS specification in Table 2 is even bigger, and they maintain their significance (column 4). Again, when the share of rural poor is also included as a control, the coefficient of urban population loses its significance and becomes positive (column 4). This confirms that urbanisation does not seem to have an independent effect on the poverty gap, and thus on the severity of poverty, other than through the effect induced by the decrease in the share of poor in the rural population. The increase in magnitude of the coefficient is confirmed even when using the absolute number of rural poor as dependent variable, although the coefficient is only 1.5 larger in this case (column 6).

We run the same regressions also for the first two periods only, obtaining similar results. The coefficient of urban population is magnified by a factor of between 3 and 5 relative to its OLS value, although it is estimated fairly imprecisely in the specifications with few control variables. This is also true for the specification using poverty gap as dependent variable (column 4), although the inclusion of the share of rural poor as a control eliminates any effect of urban population. And this is also the case for the estimation run with number of rural poor as dependent variable: the increase of the urban coefficient is 4-fold.

The results of the IV estimation may indicate a seeming contradiction. The substantial downward bias of OLS estimates suggests that an increase in poverty may be an important push factor for rural-urban migration. At the same time our results suggest that first-round effects are quite small, i.e. condition (3') (the poverty incidence is higher among migrants than among non-migrants) doesn't hold in its strong form. This apparent contradiction may be explained noting that the poor may only be slightly more likely to migrate than the non-poor

(that accounts for the small first-round effects), but the increase in rural poverty is associated with a stimulus for migration by being associated with worsening economic conditions in the rural area. To the extent that increases in rural poverty may be associated with reduction in average rural wage, higher rural poverty would be associated to increased migration due to a larger urban-rural (expected) wage gap (not due to higher level of poverty per se).

6. Conclusions

Do the poor in rural areas benefit from population growth of urban areas? And if so, what is the size of these benefits? Answers to these questions could help clarify whether trade-offs exist between urban investment and rural poverty and may help shed new light on the old debate on urban bias in developing countries. Notwithstanding the importance of these questions, little empirical evidence is available to provide adequate answers. We have tried to address this gap, by analysing the effects of urbanization on rural poverty. Using data on Indian districts between 1981 and 1999, we find that urbanization has a significantly poverty reducing effect on surrounding rural areas. Results are robust to the inclusion of a number of controls and to the use of different types of specification. The findings suggest that most of the poverty reducing impact of urbanization occurs through second-round effects rather than through the direct movement of rural poor to urban areas. We resort to IV estimation to test for causality. The results suggest that the effect is causal (from urbanisation to poverty reduction), and that failure to control for causality bias the coefficient of urbanisation downwardly. In our preferred estimations, we find that an increase of urban population by one fifth determines a decrease of between 3 and 6 percentage points in the share of rural poverty. These poverty reducing effects appear to apply mostly to rural poor relatively closer to the poverty line. Although the very poor do not seem to be negatively affected by urbanization, they are not able to reap the benefits of such a growth.

These findings may bear a number of potentially important policy implications. First, they may help re-consider the role of public investment in urban areas for poverty reduction. In fact it is a popular tenet that investments in developing countries need to be concentrated in rural areas in order to reduce poverty, as the poor in developing countries are mainly concentrated there (see for instance World Bank, 2008). However, investments in rural areas are often very onerous as substantial resources are needed to reach a population which is scattered around vast territories. To the extent that urbanization may have substantial poverty

reducing effects on rural areas, urban investments may become an important complement to rural ones in poverty reduction strategies.

Second, our findings run counter the popular myth that rural-urban migration may deplete rural areas causing them to fall further behind. The relatively low rate of urbanisation of India itself may also be due to public policies which have not facilitated (and in certain instance even constrained) rural-urban migration (Deshingkar and Start, 2005). At the very least, this paper questions the appropriateness of this bias against rural-urban migration.

Third, to the extent that the benefits from urbanisation do not spill over to the very poor in rural areas, specific actions may be needed to facilitate these rural dwellers to enjoy the benefits of urbanisation. Examples of these may include developing the types of skills useful for an expanding urban sector; or the provision of capital to cover the fixed costs of rural-urban migration.

Although this paper has not touched upon the issue of urban poverty, rising urban populations may imply that urban poverty could become in the future the main issue in its own right (Ravallion et al., 2007). Further research is needed to assess whether the growth of urban population entails a trade-off between rural and urban poverty reduction.

References

Aghion P., Burgess R., Redding S. and F. Zilibotti (2007). The Unequal Effects of Liberalization: Evidence from Dismantling the License Raj in India, *American Economic Review,* forthcoming.

Baum, C., M. Schaffer and S. Stillman, (2008), IVREG2: Stata module for extended instrumental variables/2SLS and GMM estimation, *Statistical Software Components from Boston College Department of Economics.*

Becker, G.S. and K.M. Murphy, (1992). _The division of labor, coordination costs, and knowledge, *Quarterly Journal of Economics*, 107(4), pp. 1137–60.

Berdegue, J.A., E. Ramirez, T. Reardon, and G. Escobar (2001). Rural nonfarm employment and incomes in Chile, World Development, 29(3), pp. 411-425.

Birthal, P. (2007). Linking Smallholder Livestock Producers to Markets: Issues and Approaches, mimeo, Indian Society of Agricultural Economics.

Chandra Mohan Reddy, Y.V.R. (2000), *A Study of Livestock Markets and Marketing of Livestock in Rangareddy District of Andhra Pradesh*, MSc Dissertation, Department of Agricultural Economics, Acharya N.G. Ranga Agricultural University, Hyderabad.

Datt, G. and M. Ravallion (1998), Farm Productivity and Rural Poverty in India, FCND Discussion Paper No. 42, International Food Policy Research Institute, Washington D.C.

Datt, G. and M. Ravallion, (2002). Is India's economic growth leaving the poor behind?, *Journal of Economic Perspective* 16, 89–108.

Deichmann, U. F. Shilpi and R. Vakis, (2008). Spatial specialization and farm-non-farm linkages, Policy Research Working Paper 4611: The World Bank.

Deshingkar, P. (2005). Seasonal migration: How rural is rural?, ODI Opinions no. 52.

Deshingkar, P. and D. Start (2003). Seasonal Migration for Livelihoods in India: Coping, Accumulation and Exclusion, ODI Working Paper 220.

Dore, R. (1987). *Taking Japan Seriously: A Confucian Perspective on Leading Economic Issues*, Stanford University Press: Stanford.

Ellis, F., (1998). Household strategies and rural livelihood diversification, *Journal of Development Studies*, Vol. 35(1): 1-38.

Eswaran, M. A. Kotwal, B. Ramaswami, and W. Wadhwa (2008), How does poverty decline? Suggestive evidence from India, 1983-1999, mimeo.

Fafchamps, M. and F. Shilpi (2003).The spatial division of labor in Nepal, Journal of *Development Studies* 39(6): 23-66.

Fafchamps, M. and F. Shilpi, (2005). Cities and Specialization: Evidence from South Asia, *Economic Journal*, Vol. 115, April: 477-504.

Foster, A. and M. Rosenzweig, (2004). Agricultural productivity growth, rural economic diversity and economic reforms: India 1970-2000, *Economic Development and Cultural Change*, 52(3), p.509-542.

Fujita, M., P. Krugman, P., and A.J. Venables, (1999). *The Spatial Economy: Cities, Regions, and International Trade*, MIT Press: Cambridge and London.

Government of India, various years. Census of India.

Hasan, R., D. Mitra and B.P. Ural, (2007). Trade Liberalization, Labor-Market Institutions and Poverty Reduction: Evidence from Indian States, *India Policy Forum* 3, pp. 71-122.

Jacobs, J., (1969). *The Economy of Cities*, Random House: New York.

Jha, V. (2008). Trickle down effects of Inter State Migration in a period of high growth in the Indian economy, mimeo.

Kijima, Y. and P. Lanjouw, (2003). Poverty in India during the 1990s: a regional perspective. World Bank Policy Research Working Paper 3141.

Kochar, A. (2004). Urban influences on rural schooling in India, *Journal of Development Economics* 74, pp. 113– 136

Kuznets, S., (1955). Economic Growth and Income Inequality, *American Economic Review*, 1, Vol. XLV.

Lanjouw, P. and A. Shariff (2002). Rural Nonfarm Employment in India: Access, income, and poverty impact. Working Paper Series no 81. New Delhi: National Council of Applied Economic Research.

Lewis, W. A., (1954). Economic development with unlimited supplies of labour, *The Manchester School*, 22: 139-191.

Matsuyama, K., (1992). Agricultural Productivity, Comparative Advantage, and Economic Growth," *Journal of Economic Theory* 58, pp. 317-334.

Nurske, R., (1953). Problems of capital formation in underdeveloped countries, Oxford University Press: New York.

Parthasarathy Rao,P., P.S. Birthal, P.K. Joshi and D. Kar (2004), Agricultural Diversification in India and Role of Urbanization, MTID Discussion Paper No. 77, IFPRI.

Plantinga, A.J., Lubowski, R.N. and R.N. Stavins (2002), The effects of potential land development on agricultural land prices, *Journal of Urban Economics* 52, 561-81.

Ravallion, M., (2002), On the urbanization of poverty, *Journal of Development Economics* 68, 435-442.

Ravallion, M., S. Chen and P. Sangraula, (2007). New evidence on the urbanization of global poverty, World Bank Policy Research Working Paper 4199.

Schaffer, M. (2007), XTIVREG2: Stata module to perform extended IV/2SLS, GMM and AC/HAC, LIML and k-class regression for panel data models, *Statistical Software Components from Boston College Department of Economics*

Stark, O. (1980). On the Role of Urban-Rural Remittances in Rural Development, *Journal of Development Studies*, 16(3): 369–74.

Stark, O.; and R.E.B. Lucas, (1988). Migration, remittances and the family, *Economic Development and Cultural Change*, Vol. 36 (3):465-482.

Stock, J.H. and M. Yogo, (2005). Testing for weak instruments in linear IV regression, in D.W.K. Andrews and J.H. Stock (eds.) *Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothenberg*, Cambridge: Cambridge University Press, 2005.

Thanh, H.X., D.T., Thu Phuong, N. Thu Huong, and C. Tacoli (2008), Urbanization and rural development in Vietnam's Mekong Delta, IIED Working Paper 14.

Topalova, P., (2005). Trade Liberalization, Poverty, and Inequality: Evidence from Indian Districts, NBER Working Paper No. W11614.

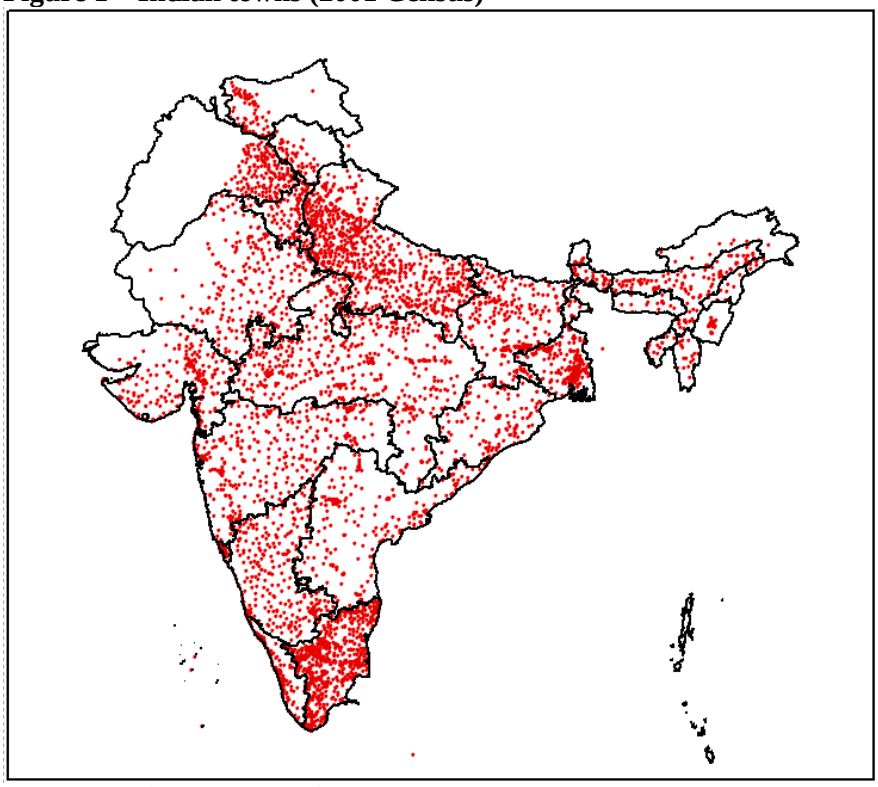
United Nations, (2008). World Urbanization Prospects: The 2007 Revision Population Database, http://esa.un.org/unup/, accessed 23 May 2008.

von Thünen, J. H., (1966). *Isolated State: an English Edition of Der Isolierte Staat*, Pergamon Press, Oxford.

World Bank, (2008). *World Development Report 2008: Agriculture for Development*, The World Bank: Washington DC.

Figures and Tables

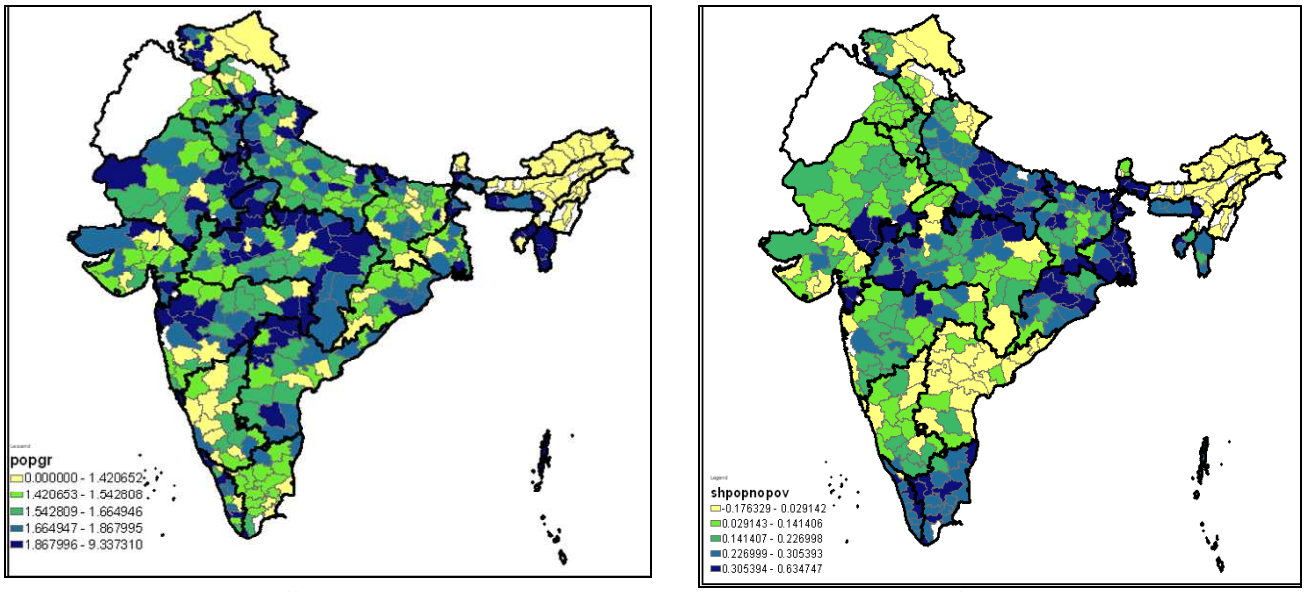
Figure 1 – Indian towns (2001 Census)



Note: the State of Delhi is excluded from the map
Source: Authors' elaboration on data from Indian Census 2001, and data on city spatial coordinates from Indian Gazetteer and GPSvisulizer,com.

Figure 2 – Urban population growth (%) and poverty reduction, by district 1981-99

(a) Urban population growth (%), 1981-97 **(b) Share of rural pop. lifted out of poverty, 1983-99**



Note: the map (b) reports the difference between the district poverty share in 1983 and 1999. E.g., a value of 0.30 means that in 1983 the share of poor rural population was 0.3 bigger than in 1999. The State of Delhi is excluded from the map
Source: Authors' elaboration on Indian Census and NSS (various rounds)

Table 2: The effects of urbanization on rural poverty across Indian districts, 1983-1999

	(1) Rural pov. (share)	(2) Rural pov. (share)	(3) Rural pov. (share)	(4) Rural pov. (share)	(5) Poverty gap	(6) Poverty gap	(7) Rural poor (in 00000)
Urban pop. (x100,000)	-0.0062***	-0.00522**	-0.00655***	-0.00615***	-0.00157**	0.000192	-0.129**
	(0.0022)	(0.0021)	(0.0021)	(0.0022)	(0.00078)	(0.00039)	(0.050)
Rural pop. (x100,000)	-0.00123	-0.00192	-0.00110	-0.000758	-0.000193	0.0000250	123,667***
	(0.0016)	(0.0016)	(0.0016)	(0.0015)	(0.00051)	(0.00022)	(17,393)
Scheduled caste (share)		0.194	0.0686	0.314	-0.0417	-0.132**	778,290
		(0.28)	(0.28)	(0.30)	(0.12)	(0.058)	(622,083)
Rural pop 15-34 age (share)		-2.920***	-3.881***	-4.103***	-1.330***	-0.151	
		(0.77)	(0.82)	(0.83)	(0.27)	(0.12)	
Rural literates 15_34 age (share in 15-34)		0.0450	-0.112	-0.122	-0.0203	0.0147	
		(0.18)	(0.17)	(0.17)	(0.057)	(0.022)	
Rural literates 15_34 x Post-1993			0.237***	0.215***	0.0807***	0.0189**	
			(0.068)	(0.066)	(0.020)	(0.0082)	
Urban poverty (share)				0.326***	0.106***	0.0122	411,996***
				(0.062)	(0.021)	(0.0085)	(109,210)
Rural poverty (share)						0.287***	
						(0.0083)	
Rural pop 15-34 age (x100,000)							-2.793***
							(0.74)
Rural literates 15_34 age (x100,000)							-0.575**
							(0.28)
Observations	997	996	996	964	964	964	964
Number of districts	363	363	363	354	354	354	354
R-squared (within)	0.65	0.65	0.66	0.68	0.76	0.95	0.59

*All specifications include district and state-year fixed effects. Robust t-statistics in parenthesis; ***p<0.01, ** p<0.05, * p<0.1; all explanatory variables are lagged two years except for Agricultural Productivity (1 year lag) and urban poverty (contemporaneous)*

Table 3: The effects of urbanization on rural poverty across Indian districts, 1983-1993, OLS

	(1) Rural pov. (share)	(2) Rural pov. (share)	(3) Rural pov. (share)	(4) Rural pov. (share)	(5) Poverty gap	(6) Poverty gap	(7) Rural poor (in '00000)
Urban pop. (x100,000)	-0.0079	-0.0093*	-0.0099*	-0.0111**	-0.0027	0.0005	-0.288***
	(0.0059)	(0.0055)	(0.0056)	(0.0055)	(0.0017)	(0.00081)	(0.11)
Rural pop. (x100,000)	0.000610	-0.000405	-0.000222	0.000468	-0.000284	-0.000419	166,112***
	(0.0022)	(0.0022)	(0.0021)	(0.0022)	(0.00082)	(0.00038)	(43,547)
Scheduled caste (share)		0.0691	0.638	0.383	-0.00927	-0.120	629,142
		(0.40)	(0.48)	(0.51)	(0.21)	(0.11)	(1,025,196)
Rural pop 15-34 age (share)		-4.619***	-5.622***	-5.313***	-1.739***	-0.207	
		(1.31)	(1.39)	(1.41)	(0.47)	(0.22)	
Rur. literates (share in 15-34)		-0.700***	-0.735***	-0.835***	-0.179**	0.0620	
		(0.22)	(0.26)	(0.26)	(0.085)	(0.041)	
Urban poverty (share)				0.378***	0.140***	0.0310	468,398**
				(0.11)	(0.040)	(0.023)	(184,511)
Rural poverty (share)						0.288***	
						(0.012)	
Rural pop 15-34 age (x100,000)							-3.314*
							(1.89)
Rural lit. 15_34 age (x100,000)							-1.065***
							(0.29)
Observations	682	682	659	659	659	659	659
No. of districts	363	363	354	354	354	354	354
R-sq. (within)	0.61	0.64	0.64	0.66	0.76	0.94	0.59

*All specifications include district and state-year fixed effects. Robust t-statistics in parenthesis; ***p<0.01, ** p<0.05, * p<0.1*

Table 4: The effects of urbanization on rural poverty across Indian districts, Further robustness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	1983-99		1983-93			1983-99	
	Rural pov. (share)	Rural pov. (share)	Rural pov. (share)	Rural pov. (share)	Rural pov. (share)	Rural pov. (share)	Rural pov. (share)
Urban pop. (x100,000)	-0.00684**	-0.00678**	-0.0153**	-0.0158**	-0.0074***	-0.0075***	-0.0065*
	(0.0027)	(0.0026)	(0.0063)	(0.0065)	(0.0027)	(0.0027)	(0.0039)
Rur. pop. (x100,000)	-0.00137	-0.000989	-0.00131	0.000411	-0.000946	-0.000992	-0.000392
	(0.0019)	(0.0018)	(0.0026)	(0.0024)	(0.0019)	(0.0019)	(0.0021)
Scheduled caste (share)	0.486	0.488	0.738	0.701	0.555	0.540	0.625*
	(0.34)	(0.34)	(0.56)	(0.57)	(0.34)	(0.35)	(0.35)
Rural pop 15-34 age (share)	-4.628***	-4.690***	-5.445***	-5.716***	-5.024***	-5.039***	-4.764***
	(0.97)	(0.99)	(1.47)	(1.54)	(0.98)	(0.98)	(1.02)
Rural literates 15_34 age (share in 15-34)	-0.0896	-0.0969	-1.067***	-1.004***	-0.135	-0.133	-0.0631
	(0.21)	(0.21)	(0.28)	(0.28)	(0.21)	(0.21)	(0.22)
Rural literates 15_34 x Post-1993	0.215***	0.218***			0.231***	0.233***	0.227***
	(0.074)	(0.074)			(0.075)	(0.075)	(0.077)
Urban poverty (share)	0.327***	0.328***	0.355***	0.380***	0.329***	0.331***	0.371***
	(0.074)	(0.073)	(0.12)	(0.11)	(0.072)	(0.072)	(0.072)
Ln Agricultural productivity	-0.0167		-0.0613**		-0.0274	-0.0268	-0.0260
	(0.020)		(0.030)		(0.020)	(0.020)	(0.021)
Ln Agr. prod. x Post-1993					0.0429***	0.0431***	0.0397**
					(0.015)	(0.015)	(0.016)
Share Internal migrants						-0.285	
						(0.58)	
Urban pop x Share fruits and vegetables							0.0201
							(0.13)
Observations	753	753	519	519	753	753	707
Number of districts	275	275	275	275	275	275	253
R-squared (within)	0.67	0.67	0.65	0.65	0.67	0.67	0.64

*All specifications include district and state-year fixed effects. Robust t-statistics in parenthesis; ***p<0.01, ** p<0.05, * p<0.1; all explanatory variables are lagged two years except for Agricultural Productivity (1 year lag) and urban poverty (contemporaneous)*

Table 5: The effects of urbanization on rural poverty across Indian districts, 1983-1999, IV Estimation

	(1) Rural pov. (share)	(2) Rural pov. (share)	(3) Rural pov. (share)	(4) Poverty gap	(5) Poverty gap	(6) Rural poor (in '00000)
Urban pop. (x100,000)	-0.0112***	-0.0117***	-0.0139***	-0.00393***	0.000105	-16243**
	(0.0033)	(0.0034)	(0.0031)	(0.0012)	(0.00052)	(6565)
Rural pop. (x100,000)	-0.000770	-0.000427	0.0000761	0.000204	0.000182	147344***
	(0.0016)	(0.0015)	(0.0017)	(0.00059)	(0.00025)	(25435)
Scheduled caste (share)	0.0646	0.292	0.406	-0.0281	-0.146**	1086769*
	(0.27)	(0.30)	(0.32)	(0.12)	(0.058)	(649713)
Rural pop 15-34 age (share)	-3.845***	-4.057***	-4.808***	-1.573***	-0.172	
	(0.79)	(0.79)	(0.88)	(0.30)	(0.14)	
Rural literates 15_34 age (share in 15-34)	-0.139	-0.153	-0.263	-0.0702	0.00652	
	(0.17)	(0.16)	(0.20)	(0.069)	(0.027)	
Rural literates 15_34 x Post-1993	0.249***	0.230***	0.281***	0.105***	0.0231**	
	(0.067)	(0.064)	(0.070)	(0.022)	(0.0094)	
Urban poverty (share)		0.323***	0.338***	0.116***	0.0173*	400081***
		(0.061)	(0.067)	(0.023)	(0.0095)	(112358)
Ln Agr. productivity			-0.128	-0.0236	0.0136	-411497***
			(0.078)	(0.021)	(0.012)	(146218)
Ln Agr. prod. x Post-1993			0.165***	0.0482***	-0.0000217	373123***
			(0.062)	(0.017)	(0.0085)	(113748)
Rural poverty (share)					0.291***	
					(0.0090)	
Rural pop 15-34 age (x100,000)						-3.695***
						(1.04)
Rural literates 15_34 age (x100,000)						-3.068***
						(1.02)
Rural lit. 15_34 age (x100,000) x post-93						0.913***
						(0.29)
Observations	950	914	753	753	753	753
Number of districts	319	306	255	255	255	255
R-squared	0.04	0.11	0.13	0.14	0.82	0.31
Kleibergen-Paark Wald F statistic	27.089	26.068	21.018	21.018	20.861	20.849
Stock-Yogo weak ID test critical values: 10% max IV size	16.38	16.38	16.38	16.38	16.38	16.38

*All specifications include district and state-year fixed effects. Robust z-statistics in parenthesis; ***p<0.01, ** p<0.05, * p<0.1; urban population is instrumented through the number of urban immigrants from other states.*

Table 6: The effects of urbanization on rural poverty across Indian districts, 1983-1993, IV Estimation

	(1) Rural pov. (share)	(2) Rural pov. (share)	(3) Rural pov. (share)	(4) Poverty gap	(5) Poverty gap	(6) Rural poor (in '00000)
Urban pop. (x100,000)	-0.0268	-0.0315	-0.0506**	-0.0147**	-0.0147**	-84,314**
	(0.020)	(0.020)	(0.021)	(0.0058)	(0.0058)	(37,104)
Rural pop. (x100,000)	0.000299	0.00111	0.00248	0.000471	0.000471	72,586
	(0.0024)	(0.0024)	(0.0031)	(0.0011)	(0.0011)	(51,350)
Scheduled caste (share)	0.174	0.556	0.877	0.133	0.133	1,104,156
	(0.44)	(0.56)	(0.67)	(0.26)	(0.26)	(1,321,009)
Rural pop 15-34 age (share)	-4.754***	-5.535***	-5.628***	-1.889***	-1.889***	
	(1.31)	(1.41)	(1.52)	(0.55)	(0.55)	
Rural literates 15_34 age (share in 15-34)	-0.738***	-0.867***	-1.073***	-0.257**	-0.257**	
	(0.21)	(0.25)	(0.29)	(0.10)	(0.10)	
Urban poverty (share)		0.390***	0.400***	0.164***	0.164***	508,135**
		(0.11)	(0.12)	(0.046)	(0.046)	(200,560)
Ln Agr. productivity			-0.0984	-0.0163	-0.0163	-378,169**
			(0.078)	(0.024)	(0.024)	(149,379)
Rural poverty (share)					-0.0147**	
					(0.0058)	
Rural pop 15-34 age (x100,000)						0.751
						(2.42)
Rural literates 15_34 age (x100,000)						-4.973***
						(1.14)
Observations	636	608	488	488	488	488
Number of districts	318	304	244	244	244	244
R-squared	0.06	0.10	0.04	0.03	0.79	0.26
Kleibergen-Paark Wald F statistic	31.941	32.260	27.910	27.910	24.834	27.105
Stock-Yogo weak ID test critical values: 10% max IV size	16.38	16.38	16.38	16.38	16.38	16.38

*All specifications include district and state-year fixed effects. Robust z-statistics in parenthesis; ***p<0.01, ** p<0.05, * p<0.1; urban population is instrumented through the number of urban immigrants from other states.*